7

Infertility

Children are the cloth of the body.
Without children you are naked.
—Yoruba Saying (Nigeria)

Fertility is important to all societies. The inability to have children has traditionally been a source of pain, anxiety, and shame. The more important children are to the fabric of a given culture, the more important it is for couples to be fertile, and the worse the consequences if a couple is infertile. Couples who are unable to bear as many children as they wish may feel anguish or emotional pain. Several reports have focused on the causes, prevention, and treatment of infertility in Africa.[4,6,10,11,13,30,45,53]

In most of Africa, a man's wealth is measured, in part, by the number of children he has. Children are important as farm workers and as a source of support in old age for their parents. Male children also play an important role in certain ethnic groups where, for example, a grandchild is the only person who can replace his departed grandfather, particularly with respect to the practice of certain rituals. Similarly, a wife's value to her husband may be determined by her ability to bear healthy children. A wife may be deserted or divorced summarily for her inability to bear children, even if the husband is the one who is infertile.

Many African doctors are becoming convinced that infertility is a problem that deserves attention in family planning programs. Family planning providers must recommend only safe, effective means of delaying or spacing children that will not impair future fertility. Sexually transmitted infections (STIs) are the leading cause of preventable infertility. (See Chapter 6 on Sexually Transmitted Infections.) Other infectious diseases, poor nutrition, and limited access to adequate health care for abortion and childbirth are also important factors in reducing fertility. If family planners are to serve the needs of general reproductive health care in their community, they should provide some degree of initial evaluation and counseling for infertility. This problem not only concerns the woman, but also the couple.

In this chapter, the term "infertility" is used to mean either a woman's inability to conceive and bear a living child or a man's inability to impregnate a woman. The following definitions are adapted from the World Health Organization's (WHO's) definitions of infertility in a couple:

- Primary infertility. The couple has never conceived despite unprotected intercourse for at least 12 months.
- Secondary infertility. The couple has previously conceived but is subsequently unable to conceive within 12 months, despite unprotected intercourse.
- Pregnancy wastage. The woman is able to conceive but unable to produce a live birth (unable to carry the fetus to a viable age).
- Subfertility. The couple has difficulty in conceiving jointly because both partners may have reduced fecundity. In this sense, "subfertility" is used interchangeably with the term "subfecundity."

EPIDEMIOLOGY OF INFERTILITY IN AFRICA

There is a recognized belt of subfertility and infertility in Africa extending from the West African countries of Senegal, Mali, Burkina Faso, Niger, and northern Nigeria through Cameroon, Gabon, Congo,

Central African Republic, Zaire, Zambia, and southwest Sudan, to the East African countries of Uganda, southwestern Kenya, Ethiopia and Tanzania.[1,14,45] Infertility also exists in other parts of Africa, but the prevalence is lower. In the South, Lesotho has a high proportion of subfecundity (37% of all currently married women).[48] The "infertility belt" corresponds quite well with the acquired immune deficiency syndrome (AIDS) belt. Both infertility and AIDS are associated with STIs.

REQUIREMENTS FOR FERTILITY

The properties of the fecund male include:

- Normal spermatogenesis and ductal system (sperm count, motility, and biologic structure and function)
- Functioning reproductive anatomy and physiology:
  - — Adequate sexual drive
  - — Ability to maintain an erection
  - — Ability to have sexual intercourse
  - _ Ability to have normal ejaculation into the vagina

The properties of the fecund female include:

- Functioning reproductive anatomy and physiology:
  - — Adequate sexual drive
  - — A vagina capable of receiving spermatozoa
  - — Normal cervical mucus to allow sperm to pass to the upper genital tract
  - — Ovulatory cycles
  - — Patent fallopian tubes that permit the sperm and ovum to meet and allow the fertilized ovum to migrate to the uterus
  - — A uterus capable of developing and sustaining the conceptus to maturity
  - — Adequate hormonal status to maintain pregnancy

- Normal immunologic responses to accommodate sperm, fertilized ovum, and fetus
- Adequate nutritional, chemical, and health status to maintain nutrition and oxygenation of placenta and fetus

Psychological, anatomic, or physiological alterations can interfere with the occurrence of pregnancy. A large study by WHO suggests that male infertility is a causative factor for 43% of infertile couples in Africa and the sole cause for 8% of couples. Female infertility is the sole cause for 37% of infertile couples (see Table 7:1). The diagnoses of infertility are noted in Table 7:2.

Table 7:1 General categories of infertility (type and causation) in developing countries

	Percentage of couples			
Category	**Africa (n=842)**	**Asia (n=1,992)**	**Latin America (n=1,228)**	**Developed Nations (n=3,904)**
Type of fertility				
Primary	48	77	60	71
Secondary	52	23	40	29
Causation				
No cause found in either	5	13	10	14
Female causes only	37	37	25	31
Male causes only	8	8	22	22
Causes found in both	35	35	30	21
Became pregnant	15	15	13	12

Source: Cates et al. (1985), WHO (1986)

Table 7:2 Male and female diagnoses of infertility in developing countries

Diagnosis	Percentage of couples		
	Africa	Asia	Latin America
Female diagnosis			
No demonstrable cause	16	31	35
Bilateral tubal occlusion	49	14	15
Acquired tubal abnormalities	12	12	12
Anovulatory regular cycle	14	9	9
Anovulatory oligomenorrhea	3	7	9
Ovulatory oligomenorrhea	4	11	5
Hyperprolactinemia	5	7	8
Endometriosis	1	10	3
Male diagnosis			
No demonstrable cause	46	58	41
Accessory gland infection	11	3	12
Idiopathic low motility	1	5	8
Primary testicular failure	7	11	13
Varicocele	20	10	19

Source: WHO (1986)

In most developing countries, the major preventable causes of infertility are STIs, postpartum infection, and postabortion infection. Tubal occlusion and pelvic adhesions resulting from STIs and complications of pregnancy cause almost 75% of all female infertility in Africa (see Table 7:2).[6,53] Most cases of infertility reported in Africa are due to secondary causes, possibly reflecting the higher rates of acquired infertility from postpartum infections and STIs.

FACTORS AFFECTING REPRODUCTIVE PERFORMANCE

Several factors are known or are strongly suspected to affect the probability of conception.

AGE OF WOMAN

A review of the Western literature demonstrated that the effects of age on fertility are moderate and do not begin until the woman is about 35 or older.[27] Older women take longer to conceive, but both clinicians and patients must carefully distinguish "waiting longer" from "never being able to conceive." Most "infertile" couples conceive eventually, whether or not they are treated. Table 7:3 shows the effects of age on fertility. The age of the woman is complicated by a host of other factors, including frequency of intercourse, age of the male partner, and the cumulative effect of medical and gynecological problems.

Table 7:3 Percentage of currently married women who are infecund, by age*

	Age							
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**Total 25-49**
Kenya	1.8	5.1	8.7	15.8	26.2	37.4	63.8	24.8
Lesotho	1.3	5.7	14.8	24.5	39.7	61.2	83.1	37.3
Senegal	1.7	4.1	7.1	12.6	31.0	48.4	74.6	28.2
Sudan (North)	3.7	6.8	11.7	20.8	29.0	56.0	79.6	30.3

*A women was defined as infecund if she reported an inability to have a child, or if she had an interval of 5 or more years without a pregnancy while she was continuously married and not using contraception.

Source: Vaessen M (1984)

Age of man

The age of a man has a significant effect on coital frequency and sexual function, which directly influence the chance of pregnancy. However, the age of a man appears to have little effect on the ability of sperm to fertilize an ovum.

Lack of understanding of reproductive biology

Another barrier to optimal fertility is a misunderstanding about timing and frequency of intercourse. For example, the cultural taboos that delay intercourse until after menses may prevent conception in some women with short cycles and long menstrual periods. Patient education is, therefore, of primary importance in fertility counseling and family planning.

Coital frequency

Infrequent coitus is a common cause of low pregnancy rates.[22,25] How frequently couples have intercourse directly affects pregnancy rates[22,35] (see Table 7:4). Although the sperm count may be slightly decreased by frequent intercourse (once per day or once every other day), the motility and number of sperm in a normal man should still be sufficient to achieve a pregnancy.[32]

Table 7:4 Frequency of intercourse and probability of conception within 6 months

Frequency of intercourse (per week)	Percent pregnant within 6 months
<1	17
1	32
2	46
3	51

Source: MacLeod and Gold (1953)

TIMING OF INTERCOURSE

Having intercourse prior to ovulation is essential to maximizing the chance of pregnancy (see Table 7:5). The ovum has a life expectancy of only 12 hours if it is not fertilized. In fact, the opportunity for fertilization is thought to last only a few hours; thus, intercourse during the 24 to 48 hours before ovulation ensures that sperm are present, and ready to fertilize the ovum when it is ready.[51]

Table 7:5 Probability of conception by day of coitus

Coital day*	Conception rate
-5	0.08
-4	0.17
-3	0.08
-2	0.36
-1	0.34
0 (ovulation)	0.36
1	0.00

*Calculated for ovulation day

Source: Wilcox, et al. (1995)

COITAL TECHNIQUE

If a woman's uterus is anteflexed (tipped slightly forward, as 70% of uteri are), the best position *may* be with the woman on her back, with hips supported and elevated by a pillow. This position would tilt the vagina to allow the semen to pool near the cervix. Having the woman remain in the position for 20 minutes or so after intercourse may give sperm more contact time with the cervix, allowing more sperm to ascend to the fallopian tubes.

Chemicals

Chemicals or other materials in the vagina may affect sperm viability. Douching and lubricants may have negative effects on fertility.

Multiple sexual partners

Exposure to multiple partners increases the risks for STIs and pelvic inflammatory disease (PID), which can cause irreversible tubal damage and ectopic pregnancy. Having multiple sexual partners also increases the risk of cervical intraepithelial neoplasia and other conditions that may require treatment, such as freezing the cervix, laser treatment, conization, and, possibly, hysterectomy. Some women develop antibodies to sperm, a condition that some clinicians believe is more likely to occur in women exposed to multiple partners. Regular use of condoms (except when pregnancy is desired) may help to prevent STIs and cervical intraepithelial neoplasia**.**

Sexually transmitted infections

The relationship between STIs and PID is discussed in Chapter 6.

Gonorrhea and Chlamydia. Gonorrhea and chlamydia are major causes of cervicitis and PID, which are associated with tubal disease and pelvic adhesions. In men, these organisms cause urethritis, epididymitis, and, possibly, accessory gland infection. These infectious diseases may cause between 10% and 90% of all infertility, depending on the geographic region and particular group studied. Although PID is the major cause of tubal infertility, chronic cervicitis may produce subfertility in some women. Chlamydia, despite its milder signs and symptoms, apparently causes more severe subclinical tubal inflammation with subsequent tubal damage than does gonorrhea.[16,43] Inadequately treated chlamydial salpingitis may appear to improve while tubal damage worsens. PID from any cause produces tubal scarring. When both tubes are scarred, adhesions either completely occlude the tube or damage the delicate mucosa and cilia necessary to assist the

movement of sperm and ova. Other pelvic adhesions (scars) may limit tubal mobility, motility, or contact with the ovary, thus interfering with capture of ova. Many of the same factors that cause pelvic damage and impair fertility also increase the likelihood of ectopic pregnancy, which may further damage the reproductive system.[7]

Human Papilloma virus. Human papilloma virus (genital warts) is a frequent precursor to cervical dysplasia. The effect of that disorder on fertility depends on treatment, which may be a required hysterectomy (should cervical cancer be diagnosed), cryosurgery, a cone biopsy, or similar treatment of the cervix for simple dysplasia. Scars from cervical treatment or damage to the cervical mucous cells sufficient to cause cervical incompetence are associated with preterm deliveries and possible pregnancy loss.

Mycoplasma. Although *mycoplasma* are frequently found in patients with other STIs, it is not known whether these organisms cause damage.

PARASITIC DISEASES

Filariasis. This parasite can damage the lymphatic drainage system of the external genitalia. In men, this condition can result in inflammation and swelling (sometimes dramatic swelling known as elephantiasis) of the scrotum, testes, epididymis, or vas deferens. In the tropical areas where this disease is prevalent, it may be a significant cause of male infertility.[39] In women, filariasis may decrease coital frequency, but little is known about the direct effects on female fertility.[24]

Malaria. In women, malaria may cause high fevers and impair fetal and maternal nutrition. Infestation of the placenta may lead to spontaneous abortion or fetal loss.[39] In men, severe malarial fevers can raise the scrotal temperature enough to alter spermatogenesis. In some areas where malaria is endemic, 60% of men suffer malarial fevers high enough to affect semen quality.[24]

Schistosomiasis. Caused by a waterborne parasite common in many African countries, schistosomiasis has not been directly linked

to male or female infertility.[24] Severe chronic infection causing liver damage may harm the individual's general health, sex steroid hormone metabolism, and sex drive.[39]

Toxoplasmosis. Transmitted primarily through cat feces and eating raw meat, toxoplasmosis may damage a developing fetus and cause fetal wastage in women who have a primary infection. Primary infections generally resolve spontaneously and confer immunity against later infections. Toxoplasmosis is not a significant cause of infertility.[39]

Trypanosomiasis. Known as *African sleeping sickness*, trypanosomiasis causes high fevers that may affect sperm production. It may also interfere with pituitary function, leading to menstrual disorders and fetal loss in women and feminization and impotence in men.[24]

Other infectious diseases

Leprosy (Hansen's disease). In its lepromatous manifestation, leprosy can cause testicular atrophy in some men with untreated infection and has been associated with male infertility. Neurologic damage from leprosy may result in impotence. In some couples, decreased coital frequency may stem from the psychosocial consequences of the disease. No female infertility caused by leprosy has been identified.[39]

Mumps. If it leads to orchitis (testicular inflammation), mumps may cause secondary testicular atrophy in the small number of men infected after puberty. Bilateral orchitis occurs in perhaps 1% of adult males with mumps; most will recover without impaired fertility.[39]

Tuberculosis. Tuberculosis is more prevalent in populations suffering from poverty, malnutrition, overcrowding, poor housing, or poor working conditions. Tuberculosis of the genital tract may develop in men or women following primary pulmonary infection, which is often unrecognized. Infection and inflammatory response may damage the fallopian tubes or the epididymis and vas deferens. Genital tuberculosis may cause a large proportion of infertility cases in Africa, which has a high prevalence of untreated tuberculosis.[39] One South African study found positive M. tuberculosis cultures in 21% of

women seeking infertility services who had no indications of infection other than infertility.[30]

Postpartum and postabortion infections. These preventable infections cause high rates of maternal mortality and secondary infertility. Postpartum infections are most prevalent where traditional birth attendants may introduce contaminating organisms by using unsanitary tools or methods. Postabortion infections are most common where safe, legal abortions performed by trained medical personnel are not available. Untrained practitioners or the use of folk methods are likely to introduce contaminating organisms or lead to an incomplete abortion, two serious risk factors in life- and fertility-threatening pelvic infections.[39,54] In the WHO study, 76.2% of African women with infection-related infertility cases had a history of either postpartum or postabortion complications.[53]

Sickle cell disease. In men, sickle cell disease has been documented as a cause of recurring priapism, with possible impotence from tissue and nerve damage leading to male infertility. In women, sickling crises or alterations in placental blood flow or oxygenation have been clearly associated with an increased rate of fetal wastage.[31]

Nutrition. Severe malnutrition is associated with infertility and fetal wastage. Even moderate nutritional deprivation leading to a drop of 10% to 15% below normal weight can interfere with menstrual cycles in women.[24] The percentage of body fat should be greater than 22% to permit regular ovulatory cycles.[15] Poor nutrition can weaken the immune system and increase the chances of acquiring an infectious disease, which can compromise fertility. Likewise, many infestations or diseases such as hookworm and malaria can lead to anemia, which may cause fetal and maternal mortality.[24] Obesity also may lead to less frequent ovulation or to less frequent intercourse, thereby contributing to fertility problems.[40]

Toxic agents. Toxic agents may well emerge as one of the principal causes of infertility among couples with no anatomic cause. Exposure can occur from occupational hazards (e.g., farming, factory work, mining); contaminated air, water or food supply; drug ingestion; or other sources.

Lead, toxic fumes, and exposure to pesticides are suspected of causing or contributing to infertility.[50,54] In women, lead poisoning reduces the likelihood of fertilization and increases the likelihood of fetal wastage. Cases of spontaneous abortion among agricultural workers have been reported. In men, exposure to lead can reduce both sex drive and sperm count. Pesticide exposure can also reduce sperm count.[50]

Smoking or alcohol use. In men, smoking tobacco and drinking alcoholic beverages may cause poor sperm quality. In women, both smoking and heavy alcohol use are associated with lower conception rates[3] and increased rates of spontaneous abortions. Smoking also appears to increase slightly the risk of placenta previa. Smoking and alcohol use also negatively affect the developing fetus and may result in low-birthweight babies.[42]

Medications. In men, narcotics, tranquilizers, antidepressants, some antihypertensives, and drugs such as guanethidine and methyldopa may cause impotence. Amoebicides, antimalarial drugs, nitrofurantoin, sulfasalazine, cimetidine, certain antihypertensives, and methotrexate may affect sperm production.[5,34,38] In women, habitual use of narcotics or barbiturates apparently decreases regularity of ovulation. Systemic, powerful anticancer drugs exert many tissue effects that may include testicular or ovarian failure, even after only one cycle of chemotherapy. Many other prescription medications, including tetracycline, several antiseizure medications, some antidepressants, some tranquilizers, and coumadin, are clearly associated with an increased risk of fetal defects. Many of these drugs may also be associated with fetal wastage.[42] If possible, couples attempting to conceive should avoid all medications.

Surgery. In men, sexual function may be reversibly or irreversibly impaired by surgery involving the penis, scrotum, prostate, or pelvis, all of which may cause nerve damage. In women, ovarian, cervical, or uterine surgery for benign processes may cause subsequent difficulties with fertilization or ovulation or lead to fetal wastage. Adhesions from any pelvic or abdominal surgery may interfere with conception.

Female circumcision. The removal of part or all of the external female genitalia, a ritual practice in parts of Africa, causes infertility in some women. The immediate consequences of the surgical procedure performed on prepubertal girls may include infection, hemorrhage, and shock. Later consequences (especially in women who undergo the extreme forms of the procedure) may include infection ascending into the reproductive tract and scarring that causes infertility related to improper drainage of urine and menstrual blood, difficulty with intercourse because full penile penetration is precluded, perineal tears and upper genital tract infections.[24,39] (See Chapter 2 on Traditional Practices.)

Radiation. Exposure to radiation may be occupational, accidental, iatrogenic, or a therapeutic component of cancer treatment. The dose and type of irradiation, as well as the site or focus of energy, may produce different results. Therapeutic radiation treatments in both men and women can sometimes be tailored to minimize gonadal exposure to optimize future fertility and gonadal function. In men, irradiation may cause chromosomal aberrations[33] and increase the risk of testicular cancer.[5] In women, irradiation may cause ovarian failure, fetal wastage, or fetal damage.[42]

Physical exertion or heat. Some highly trained female athletes, such as long-distance runners and professional dancers, may experience reversible amenorrhea without any apparent long-term detrimental effects on their fertility.[15] However, they may be at increased risk for bone loss.[19] Men who take frequent hot showers or whirlpool treatments or whose occupations involve working in high temperatures (for example, furnace workers) may subject the scrotum to temperatures high enough to reduce sperm production temporarily.[44] There is no evidence that endurance training leads to male infertility.[2]

Tight clothing. Jockey shorts and tight pants are thought to have the same suppressive effect on sperm production as do hot showers, because they warm the scrotum. No evidence supports this hypothesis.

PREVENTING INFERTILITY

The family planning or primary care clinic can provide preventive infertility counseling and medical examination for early diagnosis and treatment of STIs. Routine screening of sexually active individuals for STIs prevalent in the population also may prevent adverse consequences of the diseases. Family planners who desire to prevent infertility should do the following:

- Be up to date in their knowledge on preventing, diagnosing, and treating STIs and PID.
- Be aware that contraceptive choice influences the risk of PID.
- Begin or continue public health education efforts so that the consequences of untreated sexual infection may be fully understood by all clients, particularly young people.
- Work within the community to ensure that all individuals, including minors, have access to early and confidential diagnosis and treatment of STIs.
- Encourage sexually active young people to use condoms, diaphragms, and spermicides, which can be used along with oral contraceptives and intrauterine devices (IUDs).
- Assist young persons in identifying risk factors for STIs.

IUDs

Historically, clinicians have been concerned about whether IUD use confers an increased risk of contracting PID.[9,12,21] The pelvic infection risk is apparently small for noninfected couples in mutually faithful relationships. In addition, the Levonorgestrel IUD may be associated with less risk of PID than are other IUDs.[46] Recent studies suggest that previous risk estimates of PID among IUD users may have been high.[9] Family planning workers should take the following actions:

1. Be conservative in using IUDs for nulliparous women who plan to have children. Many clinicians refuse to insert IUDs into nulliparous women.

2. Avoid recommending the IUD to women who are at greater risk for STIs and PID (especially adolescents).
3. Screen for STIs in all patients in whom an IUD is inserted.
4. *Never* insert an IUD into a woman with an untreated STI.
5. Consider giving antibiotic prophylaxis to women who live in areas where incidence of STIs is high. (See Chapter 15 on Interuterine Devices.)
6. Assume that a vaginal discharge in the presence of an IUD signals an infection until proven otherwise. (See Chapter 15 on Interuterine Devices.)
7. Be certain that clients are aware of the danger signs of a pelvic infection and that they know where to go and what to do if these signs occur.

THE PILL

Compared with IUD users or those who use no contraceptive method, women who use oral contraceptives have a lower risk of symptomatic PID, possibly because they have decreased menstrual flow and myometrial activity, as well as a less penetrable cervical mucus.[9] (See Chapter 13 on Combined Oral Contraceptives.) Oral contraceptives may also protect against tubal damage.[9] The pill appears to decrease the likelihood of acute gonococcal pelvic infection.[36] Although the relationship between oral contraceptive use and chlamydia infection risk is still being clarified, it is now accepted that the risk of cervical infection with chlamydia is enhanced among oral contraceptive users (as compared with non-users).[9,49] The risk of ascending infection is currently unknown, but oral contraceptive use may lessen the damaging effects of inflammation.[9]

Amenorrhea and temporary infertility following use of the pill do not appear to seriously threaten female fertility. These symptoms are most commonly found in women who have irregular menses before beginning oral contraceptive therapy.

Because an increased risk of cervical cancer among pill users appears likely, screening for cervical cancer and early diagnosis and treatment of STIs is important. (See Chapter 13 on Combined Oral Contraceptives.) Family planning workers should take the following actions:

1. Educate patients about the relationship between the pill and PID.
2. Urge pill users at high risk for STIs to use barrier contraception as well and to limit their number of sexual partners.

Barrier methods

The use of condoms and other barrier methods can reduce the risk of STIs such as chlamydia and gonorrhea, both of which are associated with PID and tubal infertility.[9] (See Chapter 6 on Sexually Transmitted Diseases.) Clients who have had a previous episode of PID especially should be counseled about barrier methods to avoid infection.

Unprotected intercourse can lead to the development of sperm antibodies in women, although it is unclear whether immunity to sperm causes infertility. The use of condoms has been widely encouraged to reduce the risk of developing immunologic reactions to sperm.[42]

Sterilization

Family planners have expressed concern over the number of requests for sterilization reversal, an expensive procedure with uncertain prognosis. Table 7:6 shows the reasons for requesting reversal in a survey of 100 female patients.

Table 7:6 Reasons for requesting reversal of sterilization

Reason	Percentage
Change of marital status	63
Death of child	17
More children wanted (marital status same)	10
Psychological reasons	6
Other tragedy	4

Source: Gomel (1980)

Family planning workers should take the following actions:

1. Emphasize the permanence of the procedure.
2. Avoid using the term "tying the tubes" to describe sterilization procedures; to some patients, such reference might imply that "untying the tubes" is feasible.[17] (See Chapter 21 on Voluntary Surgical Contraception.)
3. Make efforts to assure clients have access to reversal procedures. This may require changes in laws relating to health insurance and in public funding of health systems.

ABORTION

Although complications after an abortion rarely occur if it has been performed by trained medical personnel in a modern medical facility and with modern, sanitary, safe equipment, there is a slight risk that subsequent fertility may be reduced. No epidemiologic evidence supports a fertility risk to women experiencing first trimester vacuum abortions. However, a slightly increased risk to reproductive performance exists when larger cervical dilation is used for some dilation and curettage (D&C) abortion procedures or when the abortion is performed in the second trimester.[20] The most obvious way to prevent these rare occurrences is to prevent the pregnancy (and thus the abortion).

When abortions are performed by untrained personnel without adequate attention to hygiene or appropriate equipment, the risk of complications is much higher. Illegal abortions are frequently provided in unsafe conditions. In addition to postabortion infections, perforation, hemorrhage, scarring, incomplete abortion, and cervical lacerations are more common in illegal or "homemade" abortions. (See Chapter 22 on Postabortion Care: Treating Complications and Providing Contraception.) Illegal abortion is a major cause of maternal mortality in Africa. (See Chapter 1 on Benefits of Family Planning.)

THE INFERTILITY EVALUATION AND THE FAMILY PLANNER

Triaging (sorting by urgency) is the important task of the first counselor to see the infertile client or couple. A couple who has had sufficient exposure (about 12 months of unprotected intercourse) deserves to discuss the topic with their provider and have their fertility investigated or be referred for a workup, rather than simply be given advice to "wait and see." Begin an infertility evaluation as soon as is reasonable, if the following conditions apply:

1. The woman is in her late 30s. Because a steep decline in fertility occurs after age 40, women over age 35 should receive priority for early assessment.
2. The woman reports irregular menses. This symptom could signal sporadic ovulation, a condition unlikely to improve spontaneously unless the woman is an adolescent. It could be a sign of premature ovarian failure (early menopause). Irregular or abnormal bleeding may be a symptom of pelvic infection or other gynecological disease, making evaluation necessary. Many of these problems are easily and successfully treated.
3. The medical history for the couple includes mumps in the man; repeated miscarriages, ectopic pregnancy, or PID in the woman; or previous pelvic surgery or other serious medical problems in either partner. Because time is not likely to

improve such problems but will cause the couple's fecundity to steadily diminish, diagnose the cause of subfertility and begin infertility treatment promptly.

4. The woman has severe progressive dysmenorrhea or dyspareunia. These symptoms may suggest endometriosis or other pelvic disease.
5. The woman used an IUD in the past; had a pelvic infection; had surgery on an ovary, a tube, or the uterus; or has any finding that might suggest damage to her pelvic organs (e.g., endometriosis, ovarian cyst, fibroid). An early assessment, including a laparoscopy, can lead to an early diagnosis and treatment or to reassurance that "more time" is needed.
6. The couple lives in an area with a high endemic incidence of STIs.

Even if economic, personnel, and laboratory resources may be limited, some basic initial services can be provided by most family planning programs. The following services may help some couples improve fertility and may provide the first steps for those who need further evaluation or treatment. Evaluation begins with the first four items listed and, where resources and training permit, includes all of the following:

1. Educating the patients
2. Gathering pertinent historical information
3. Providing a thorough physical exam
4. Providing a resource for reassurance, counseling, and emotional stability, including referral as needed
5. Systematically evaluating the possible defective areas:[37]
   - Counseling couples about fertility awareness techniques (see Chapter 18 on Fertility Awareness) and optimal coital timing
   - Checking couples for asymptomatic sexually transmitted infections (STIs) that could cause subfertility

- Determining whether ovulation takes place, as indicated by basal body temperature or cervical mucus records (or urine luteinizing hormone test kits where available)
- Analyzing semen

6. Making a plan and initiating treatment based on information gathered, and counseling couples with potentially serious or undetected fertility problems about their options for further evaluation and treatment
7. Reassessing progress at predetermined intervals
8. Referring couples to other infertility specialists or adoption agencies as needed, explaining the anticipated short- and long-term costs and chances for success with further treatment, and discussing the options of adoption or remaining childless

History and Physical Assessment

Before beginning the evaluation process, explain the main steps that will be needed for diagnostic evaluation and describe the capacity of your facility. The history and physical exam may indicate the need for further evaluation. Explain that your approach is only one of many potential testing options. A recommended schedule of evaluation is described in Table 7:7. Clinics that carry out only a few of these items should provide referrals for the remaining services. If referral becomes necessary, try to ensure that procedures are not duplicated unnecessarily and that an orderly evaluation can be continued. Following a standard set of guidelines, such as the WHO flow sheet of the standardized approach to the infertile couple,[54] will enhance the effectiveness of referral prognosis.

Table 7:7 Fertility assessment schedule

The initial assessment of the couple should proceed in a systematic manner, with the objective of completing the first line of infertility evaluation within two or three cycles. A schedule for visits is as follows:

Visit 1
Family planning clinic visit (ideally day 5-10 of menstrual cycle)
Previous medical records obtained
Complete medical history of man and woman
Physical examination of man and woman
Develop investigation plan

Between Visits
Man obtains physical exam if not already completed
Semen evaluation
Basal body temperature and fertility awareness record keeping (see Chapter 18)

Visit 2
Clinic visit (pre-ovulatory day 13 of 28-day cycle) to check cervical mucus

Between Visits
Blood tests on day 22 of 28-day cycle: serum progesterone, etc.

More Extensive Tests (if available)
Laboratory tests, if indicated, such as anemia screening, thyroid or prolactin level, or progesterone level at mid-luteal phase to confirm ovulation
Hysterosalpingogram on day 5-10 of cycle when not bleeding

Source: Gomel (1980)

History

Ask about the individual's attempts to conceive. Interview each individual about exposure to the factors that influence reproductive performance, including anatomical, infectious, and toxic factors. After interviewing the couple together, the counselor should interview the man and woman separately to obtain confidential information.

Physical Examination of the Woman

Visually evaluate the hair distribution and body and breast development for signs of endocrinopathies or developmental deficiencies

such as hypogonadism, adrenal hyperplasia, hypothyroidism, ovarian dysfunction, and hyperprolactinemia. Perform a complete pelvic exam (palpation of uterus and adnexae and a speculum exam of vagina and cervix) to detect any uterine hypoplasia, adnexal tumors, or cervical lesions. The exam should indicate whether dyspareunia may be a problem.

Physical Examination of the Man

Visually inspect sexual characteristics to identify endocrinopathies such as hypogonadism or Klinefelter's syndrome (the genetic XXY anomaly often associated with infertility). A penile exam can reveal hypospadias (displacement of the urethral opening) or phimosis (constriction), cysts, cryptorchidism (undescended testicles), vas thickening or absence, hydrocele (fluid accumulation in testes or along spermatic cord), or varicocele (dilation of the veins of the spermatic cord in the scrotum).

Semen Evaluation

Usually, arrangements must be made with the laboratory before the man brings in a specimen for a semen evaluation. (Table 7:8 gives directions for obtaining a semen specimen.) The technician will need 2 to 5 cc and will look for directional motility in over 60% of sperm present, 60% normal morphology, and a count of at least 20 million sperm/ml. If the sperm count is at least 15 to 20 million, the absolute number of sperm is probably less critical than their motility and morphology. The presence of bacteria or white blood cells, as well as semen viscosity, also should be recorded. More than one evaluation may be necessary to assess accurately the sperm and semen status, particularly if the results are borderline—WHO recommends two samples taken at least 2 weeks apart. (Table 7:9 provides the WHO criteria for semen evaluation.[52])

Following the initial history, physical exam, and basic diagnostic laboratory procedures, inform the patient about the further tests that may be needed and make initial recommendations.

Table 7:8 Directions for collecting semen for evaluation

1. Abstain from intercourse (no ejaculation) for at least 3 and no more than 5 days. Do not drink alcohol or take a hot shower or bath just before producing the semen.
2. Masturbate. Ejaculate into a small, sterile, dry, wide-mouthed jar.
3. Take the semen specimen to the laboratory within an hour of collection.
4. Keep the semen specimen close to body temperature.

Intermediate Assessments and Tests

Patients should be instructed on how to record basal body temperatures and chart mucus changes, as described in Chapter 18. This documentation often helps verify ovulation, determine the timing and frequency of intercourse, and educate the client about the physiology of the menstrual cycle. The timing of various tests also can be recorded and guided by this documentation.

Mucous assessment can be used to verify ovulation. At a visit 1 day prior to ovulation, a small amount of cervical mucus is drawn into a thin catheter from the endocervical canal and evaluated by microscope. Abundant acellular, watery cervical mucus that exhibits ferning and has a spinnbarkeit of greater than 8 cm is good evidence of a normal ovulatory cycle pattern.

Table 7:9 Criteria for a normal semen sample

A semen sample is considered normal if it meets all of the following conditions:	
Spermatazoa	
Concentration	>20 x 10^6/ml
Motility	>40% progressively motile
Morphology	>50% normal forms
Viability	>60% alive
Agglutination	none
Seminal fluid	
Normal appearance	
Normal viscosity	
Less than 10^6 white blood cells/ml	

More Specialized Tests (Not Available at Most Family Planning Clinics)

Economic considerations are critical in deciding whether to introduce specialized services. The more technology-driven evaluations and treatment far exceed most people's financial resources and are too expensive for most health programs to provide. Careful consideration must be given in determining the extent of services to be covered in the family planning clinic.

Laparoscopy

Consider performing a diagnostic laparoscopy when pelvic pathology (such as anatomical abnormality or damage or obstruction of tubes) is suspected or when the patient has a history of PID.

COUNSELING ABOUT TREATMENT POSSIBILITIES

Frequently, the role of the provider in infertility is to reassure (intelligently) and intervene at the right time. A principal responsibility is to tell the patient when the time has come to consider adoption, to discontinue therapy, or to proceed on some other course.

Often, simple instructions about intercourse technique and timing are helpful. Encourage the couple to maximize the chance for pregnancy by having intercourse two or three times weekly, with special attention to the two or three days immediately preceding expected ovulation. Avoid use of any vaginal products—including lubricants, douche, or drying agents.

Infertility therapy, like any other medical therapy, is generally directed toward curing or improving diagnosed anatomic and physiological problems. In addition, comprehensive infertility treatment seeks to maximize the chance of pregnancy by optimizing all conditions for conception. For many patients who have no identifiable cause of infertility, the comprehensive approach is the only therapeutic option, provided that all possible diagnostic tests have been adequately

completed. As the treatment of identified problems is well outlined in general references, it will not be described in great detail here.

Male infertility may be treated with insemination from donor sperm in cases of azoospermia or impotence. Particular attention must be paid to guaranteeing that the semen does not carry any organisms that produce STIs, including human immunodeficiency virus (HIV). Criteria for preparation, storage, and screening have been developed by the American Fertility Society. Its current recommendation is to use sperm that has been frozen and quarantined for 6 months. If the donor is still HIV antibody negative after 6 months, the sperm may be released.[18]

Female infertility may be treated with a much wider range of approaches:

1. Cervical mucus problems impairing conception may be treated with insemination or uterine instillation of a small amount of specially prepared sperm.
2. Cervical incompetence interfering with continuing pregnancy may be treated with cerclage, bed rest, or both. Cerclage is the passage of a strong suture material around the cervix, like a purse string, to prevent premature dilation.
3. Ovulation disorders can be treated with drugs to induce ovulation (such as clomiphene citrate, which suppresses estrogen's suppressive effect on ovulation). In women whose ovulation is suppressed by hyperprolactinemia (high blood levels of the pituitary hormone prolactin), ovulation may be induced with drugs that suppress prolactin, such as bromocriptine.
4. Damage to ovaries, such as torsion, surgical removal, hemorrhagic cyst, or premature menopause that has eliminated primordial follicle tissue required to produce new ova, can be overcome only by some use of high-technology fertility medicine with ova donated from another woman.
5. Uterine or tubal abnormalities may be corrected by surgical procedures (in some cases "microsurgery"). Some congenital

anomalies, such as true bicornuate uterus, may not be amenable to surgical repair. In the case of tubal damage caused by endometriosis, hormonal suppression of the displaced endometrial tissue may be prescribed before or instead of surgery. Tubal or pelvic scarring due to PID may be improved with microsurgery of the tube or laparotomy to allow lysis of pelvic adhesions. Currently, the delicate cilia and mucosa of the tubal lining cannot be surgically regenerated, and the body's capacity to repair itself is low. In vitro fertilization may be the only way to bypass damaged fallopian tubes.

High technology approaches to overcoming infertility have had some remarkable developments in the past 15 years. These expensive methods require expert practitioners and procedures and result in successful pregnancies at rates near the normal fecundity rates. The following are two of the major high-technology approaches:

- *Gamete intrafallopian tube transfer* (GIFT) involves placing a mixture of ova and sperm into the fallopian tube. It is used primarily for unexplained infertility and where the fallopian tubes appear normal. National surveys in the United States indicate a pregnancy rate of 29% per treatment cycle.[26]
- *In vitro fertilization* (IVF) involves placing mature ova (harvested during laparoscopy or transvaginally using an ultrasound-directed needle to aspirate the oocyte) with specially prepared sperm in a laboratory tissue culture medium and incubating them to allow fertilization. Fertilized ova that have successfully attained a certain maturity (generally between two and eight cell divisions) are placed in the uterus via a transcervical catheter. Surveys in the United States indicate a pregnancy rate of 19% per treatment cycle.[26]

GIFT and IVF frequently use ovulation stimulation drugs to increase the number of ova ready for harvest.

COPING

The effect of permanent infertility, coupled with the stresses of fertility evaluation and treatment, may damage a couple's relationship or an individual's self-concept. Explore the coping mechanisms that are used in the client's cultural context. In some cultures, for example, an infertile man may ask a close relative to father his children. Infertile women may be encouraged to adopt a relative's baby. In some cases, the husband of an infertile woman may divorce her and marry someone who can provide children. Family planning agencies should remain sensitive to the special needs of infertility patients.

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